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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,546	01/05/2007	Jinbo Bai	BJS-5006-11	9696

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EXAMINER	
MCCRACKEN, DANIEL	

ART UNIT	PAPER NUMBER
1736	

MAIL DATE	DELIVERY MODE
12/27/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,546	BAI ET AL.	
	Examiner	Art Unit	
	DANIEL C. MCCRACKEN	1736	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 June 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10 and 12-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 12-17* is/are rejected.

7)☒ Claim(s) *10 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of Application

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/18/2010 has been entered.

The remarks state "Claims 1-17 are pending." (Remarks of 6/18/2010 at 5). This does not reflect the claims filed. Applicants cancelled Claim 11 in the reply filed 6/18/2010. Claims 1-10 and 12-17 are pending. Claims 1-4, 9 and 12 are currently amended. Claim 11 is acknowledged as cancelled.

Information Disclosure Statement

The information disclosure statement filed 12/9/2010 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the

content of the information, of each patent listed that is not in the English language, specifically JP 2003-002800. This item has been crossed off and has not been considered.

Response to Arguments

Claim Rejections – 35 U.S.C. §102

I. With respect to the rejection of Claims 1-8, 11 and 15 under 35 U.S.C. 102(b) as being anticipated by Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865 (hereinafter "Singh at __") in view of US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, http://www.accessscience.com, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter "Heaney at __") to show a state of fact, the traversal is on the grounds that "the quartz flakes of the Singh reference are not included in the claimed invention because they are not composite reinforcement materials." (Remarks of 6/18/2010 at 6). This is not understood. Even as amended, Applicants define the "composite reinforcement supports" as including "SiO_2 particles and fibers." See Claim 4. Applicants have not traversed the finding of quartz, i.e. SiO_2 or the dimensions. The change in the claim language appears semantic. The rejection is MAINTAINED, updated to address amendments.

Claim Rejections – 35 U.S.C. §103

I. With respect to the rejection of Claim 11 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ma, et al., Catalytic growth of carbon

nanofibers on a porous carbon nanotubes substrate, J. Mater. Sci. Letters 2000; 19: 1329-1931 (hereinafter "Ma at __"), this rejection is mooted by cancellation and WITHDRAWN.

II. With respect to the rejection of Claim 12 under 35 U.S.C. 103(a) as being unpatentable over Ma, et al., Catalytic growth of carbon nanofibers on a porous carbon nanotubes substrate, J. Mater. Sci. Letters 2000; 19: 1329-1931 as applied to claim 11 above, and further in view of Andrews, et al., Carbon nanotube polymer composites, Current Opinion in Solid State and Materials Science 2004; 8: 31-37 (hereinafter "Andrews at __"), the traversal is on the grounds that:

> The applicants submit that Ma teaches a process for growing carbon nanofibers onto porous carbon nanotube pellets. First, the resulting product is carbon nanofibers having one extremity bound to the surface of carbon nanotube pellets. In contrast, in the claimed composite material, the carbon nanotubes are grown onto nanometric and/or micrometric-sized composite reinforcement supports, that is, one extremity of carbon nanotubes is bound to the surface of the nanometric and/or micrometric-sized composite reinforcement supports.

(Remarks of 6/18/2010 at 7). This has beenconsidered but is not persuasive. This is a distinction without a difference. The remarks go on to state that "the applicants submit that the carbon nanofiber/carbon nanotube pellet product disclosed in the Ma reference is at most a nanoscale/millimeterscale product."Id. On reconsideration, this is persuasive. However, it is noted that the amendment to Claim 12 creates a new embodiment by not requiring the carbon fiber supports. The rejection is WITHDRAWN.

III. With respect to the rejection of Claims 1-8 and 15-16 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res

Innovat 1998; 2: 128–141 (hereinafter "Rao at __) in view of Ma, et al., Processing and properties of carbon nanotubes–nano-SiC ceramic, Journal of Materials Science 1998; 33: 5243-5246 (hereinafter "Ma II at __"), the traversal states "Rao teaches the growth of carbon nanotubes in a quartz tube (see figure 1), but not on nanometric and/or micrometric-sized composite reinforcement supports." (Remarks of 6/18/2010 at 8). This misstates the office action or is a piecemeal treatment of the reference. Rao is cited as the convention CVD process. Ma II was cited for the advantages of growing nanotubes on SiC supports. The remarks presented are basically restating the references. The motivation was not traversed and is presumed correct. The rejection is MAINTAINED, updated to address amendments.

IV. With respect to the rejection of Claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 as applied to claim 1 above, and further in view of US 2003/0119920 to Wang, et al., the traversal is on the grounds that "Wang .. . lacks at least a teaching or suggestions of contacting a nanometric and/or micrometric-sized composite reinforcement supports." (Remarks of 6/18/2010 at 9). On reconsideration, Wang does not appear to teach the size of the support. The rejection is WITHDRAWN.

V. With respect to the rejection of Claims 9-10 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al.. as applied to claim 1 above, and further in view of US 2006/0052509 to Saitoh, Applicants have perfected their foreign priority and

disqualified the Saitoh reference. (Remarks of 6/18/2010 at 5). The rejection is accordingly WITHDRAWN.

VI. With respect to the rejection of Claim 12 under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865, US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, http://www.accessscience.com, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter "Heaney at __"), as applied to claim 1 above, and further in view of Andrews, et al., Carbon nanotube polymer composites, Current Opinion in Solid State and Materials Science 2004; 8: 31-37, the traversal is on teh grounds that "[t]he cited combination of art lacks a teaching or suggestion of at least a reinforcement material consisting essentially of carbon nanotubes grown on nanometric and/or micrometric-sized composite reinforcement supports." (Remarks of 6/18/2010 at 10). The remarks appear to rely on the remarks in connection with the anticipation rejection. The remarks set forth above apply mutatis mutandis. The rejection is MAINTAINED, updated to address amendments.

VII. With respect to the rejection of Claims 1-4 and 13 under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 in view of US 6,979,433 to Saito, et al., the traversal is on the grounds that (succinctly stated), Saito doesn't teach the nanometric/micrometric support. This is persuasive. The rejection is WITHDRAWN.

VIII. With respect to the rejection of Claims 1, 5 and 14 under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865 in view of WO 00/17102 to Smalley, et al. and Maruyama, et al., Low-temperature synthesis of high-purity single-walled carbon nanotubes from alcohol, Chemical Physics Letters 2002; 360: 229-234 (hereinafter "Maruyama at __"), the Remarks rely on remarks presented in connection with another rejection. The remarks above are relied on. The rejection is MAINTAINED, updated to address amendments.

Claim Objections

I. Claims 10 and 17 are objected to because of the following informalities:

Claim 10 would appear to either contain an artifact of prior prosecution or a misplaced dash between "or" and "a." Claim 17 contains an underscore between "is" and "SiC." Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

I. Claims 1-10 and 12-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The analysis for analyzing

claims for compliance with the written description requirement is set forth in MPEP 2163 II. A., and is succinctly summarized as:

> 1. For Each Claim, Determine What the Claim as a Whole Covers
>
> 2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step
>
> 3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed.

The following findings are made in light of the analysis set forth in MPEP 2163 II. A.:

1. For Each Claim, Determine What the Claim as a Whole Covers.

Independent Claim 1 now recites "composite reinforcement." Independent Claim 12 recites the same language. These claims apparently cover some manner of making nanotubes and composites.

2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step.

The remarks filed 6/18/2010 called out paragraphs 6-18 of the US PGPUB versus the disclosure as originally filed. This would appear to correspond to (S. 2: 17 – 3: 24). This passage has been reviewed and there does not appear to be support for growing nanotubes on "nanometric and/or micrometric-sized composite reinforcement." The only mention of "composite" is in the context of later produced composites. See (S. 2: 33-35). The disclosure as filed does not provide for growing nanotubes on (or in the parlance of the claim "obtaining carbon nanotubes bound to") composites. The disclosure refers to "support materials," generally

ceramics – see (S. 3: 26-31) – but not "composites." This amendment broadens the scope of the claim and represents new matter.

3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed.

As the Specification appears directed towards growing nanotubes on a support versus on a "composite reinforcement supports," one of skill in the art would not recognize Applicants had possession of the claimed invention. To the extent Applicants believe otherwise, they are respectfully requested to cite with particularity to the Specification as filed. This is in accordance with MPEP practice and would be helpful in withdrawing the rejection. See MPEP 714.02 ("Applicant should also specifically point out the support for any amendments made to the disclosure.") All dependent claims not specifically addressed import the issues of the claims from which they depend.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

I. Claims 1-10 and 12-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The "composite reinforcement supports" language present in independent Claim 1 and Claim 12 is not understood. As discussed above, the "composite reinforcement supports" language does not appear to be supported by the disclosure and as such, it is impossible to ascribe a meaning to it. All dependent claims not specifically addressed import the issues of the

claims from which they depend. To the extent Applicants believe otherwise, they are respectfully requested to cite with particularity to the Specification as filed, per MPEP practice.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

I. Claims 1-8 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865 (hereinafter "Singh at __") in view of US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, http://www.accessscience.com, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter "Heaney at __") to show a state of fact.[1]

With respect to Claim 1, and notwithstanding the ambiguities associated with this claim, this claim requires "contacting the supports with a mixture of a carbon source compound and a catalyst_in a stream of inert gas and hydrogen, the step of contacting being effected by chemical vapor deposition (CVD)." Singh teaches a process for growing nanotubes on quartz particles. (Singh at 861, col. 2). Quartz is claimed in a dependent claim and is being interpreted as a "composite reinforcement supports." The quartz particles have "a thickness of not more than 100 nm and diameters of several microns." Id. Singh actually suggests smaller particles, by virtue of the ball milling disclosed. Id. As such, they are "nanometric and/or micrometric-sized." The chemical formula for quartz is silicon dioxide, SiO_2. See (Heaney at 1) ("Quartz is a crystalline form of silicon dioxide (SiO_2)."). Thus Heaney is provided to explain the meaning of the term

"quartz" in the Singh reference. Heaney is an encyclopedia accessed in 2010 (i.e. a non-102 date), but note that the bibliography references 102(b) date references. (Heaney at 4). Note also that non-critical date references can be used to show scientific truisms, etc. See MPEP 2124. Likewise, similar teachings can be found in 102(b) patent literature. See e.g. (Rice 2: 12) ("quartz (silicon dioxide)") (only relied on to show that quartz is known as silicon dioxide). SiO_2 is one of the "ceramic supports" described in the Specification at e.g. (S. 9: 20) and claimed/defined in a dependent claim (Claim 4). These supports are contacted with a carbon source and a catalyst in an inert/hydrogen stream. (Singh at 861, col. 1) (ferrocene/toluene). The reaction is carried out in the vapor phase, i.e. it is a "CVD" process. Id. As to Claim 2, a temperature of 700-760 °C is taught. Note that Singh also discloses characterization of the product with a scanning electron microscope, suggesting that the product was cooled to room temperature. As to Claims 3-4, Singh discloses quartz (i.e. SiO_2) flakes or particles. (Singh at 861, col. 2). As to Claims 5 and 15, toluene is a liquid hydrocarbon As to Claim 6, ferrocene (an iron metallocene) is taught. (Singh at 861, col. 1). As to Claim 7, a solution of 2-9.6 wt% ferrocene is taught. (Singh at 861, col. 1). As to Claim 8, a 10% inert/hydrogen mixture is taught. Id.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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[1] Multiple reference rejections under 35 U.S.C. 102 are proper when the extra references are cited to, inter alia

I. Claims 1-8 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 (hereinafter "Rao at __) in view of Ma, et al., Processing and properties of carbon nanotubes–nano-SiC ceramic, Journal of Materials Science 1998; 33: 5243-5246 (hereinafter "Ma II at __").

With respect to Claim 1, Rao teaches a CVD method for growing carbon nanotubes. See generally (Rao at 129 et seq.) ("Experimental"). Rao teaches argon (i.e. an inert), hydrogen, and benzene (i.e. a carbon source). See e.g. (Rao at 129) ("Fig."). A metallocene catalyst is recited. Id. The catalyst is vaporized (Rao at 132, col. 1) and passed with the carbon source into the second furnace where the nanotubes are deposited. Id. To the extent Rao may not teach the substrate/support (i.e. "ceramic material") required by the claims (Claims 1-4), this does not impart patentability. Ma II teaches that SiC coupled with carbon nanotubes might improve the brittleness of ceramics. (Ma II at 5243). One would be motivated to grow nanotubes on SiC for any number of reasons, for example the elimination of the mixing step Ma II employs to make their ceramics/composites. Note that the sizes are suggested. (Ma II at 5243, col. 2). To the extent they aren't changes in size do not impart patentability. MPEP 2144.04 IV. As to Claim 2, temperatures of 1173 and 1373 K (i.e. approx 900 and 1100 C) are taught. (Rao at 130). Recovery details are taught at (Rao at 132, col. 1) (sonication). To the extent Rao doesn't recite in haec verba "cooling to room temperature," it is expected that this step necessariliy occurs, as evidenced by the micrographs. Stated differently, it is highly unlikely that 1100 C nanotubes were placed in a microscope. Note also the "cold trap" shown in the apparatus. (Rao at 129)

"[e]xplain the meaning of a term used in the primary reference." MPEP 2131.01.

("Fig. 1a-c"). This is the evidence offered to show inherency. As to Claim 5 and 15, benzene is taught. (Rao at 129). As to Claims 6 and 16, ferrocene and iron pentacarbonyl are taught. Id. As to Claim 7, the ratios appear to be taught. (Rao at 132, col. 1). To the extent they arent, it is axiomatic that the amount of catalyst necessarily effects the rate of reaction, conversion, etc., and is readily optimized. Note also the discussion at (Rao at 133, col. 2) suggesting controlling the relative amounts. As to Claim 8, note the ratios taught at (Rao at 132, col. 1).

II. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 as applied to claim 1 above, and further in view of US 2003/0119920 to Wang, et al.

The preceding discussion of Rao is expressly incorporated herein by reference. With respect to supports of Claims 1-4 – to the extent they are not taught by Rao, they are disclosed by Wang. See (Wang 3: [0042]). Growth of the nanotubes on the supports taught by Wang would allow for incorporation into the structures suggested by Wang. See (Wang 3: [0043] et seq.). Changes in size do not impart patentability. MPEP 2144.04 IV.

III. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al.. as applied to claim 1 above, and further in view of Choi, et al., Controlled deposition of carbon nanotubes on a patterned substrate, Surface Science 2000; 462: 195-202 (hereinafter "Choi at __").

The preceding discussion of Rao and Wang is expressly incorporated herein by reference. To the extent Claims 9-10 require the coating of the support with a silane, and to the extent neither Rao or Wang discloses such a step, Choi does. See (Choi at 196-197). One would be

motivated to apply a silane, as it provides for selective deposition of the nanotubes on the substrate. Id.

IV. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 and US 2003/0119920 to Wang, et al.. as applied to claim 1 above, and further in view of Xu, et al., A method for fabricating large-area, patterned, carbon nanotube field emitters, Applied Physics Letters 1999; 74(17): 2549-2551 (hereinafter "Xu at __").

The preceding discussion of Rao and Wang is expressly incorporated herein by reference. To the extent Claim 17 require coating a substrate with SiC, and to the extent neither Rao or Wang discloses such a step, Xu does. See (Xu at 2549). One would be motivated to coat the substrate with silicon carbide, as it can act as abarrier layer to prevent reactions. Id.

V. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865, US 5,770,099 to Rice, et al. and Peter J. Heaney, "Quartz", in AccessScience@McGraw-Hill, http://www.accessscience.com, DOI 10.1036/1097-8542.563500, accessed on 6 January, 2010 (hereinafter "Heaney at __"), as applied to claim 1 above, and further in view of Andrews, et al., Carbon nanotube polymer composites, Current Opinion in Solid State and Materials Science 2004; 8: 31-37.

The preceding discussion of Claim 1 accompanying the anticipation rejection supra is expressly incorporated by reference. With respect to Claims 12, to the extent Singh does not teach the polymer matrix, adding the CNT to a polymer matrix is an obvious expedient. Andrews teaches that adding carbon nanotubes to polymer matrices is desirable to improve the mechanical as well as other properties of the composites. See (Andrews, entire document). One would be motivated to do so for any number of reasons, including harnessing the thermal conductivities exhibited by CNT. See (Andrews at 31, col. 1) ("CNTs possess one of the highest thermal

conductivities known, which suggests their use in composites for thermal management.") (citations omitted).

VI. Claims 1, 5 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh, et al., Towards the production of large-scale aligned carbon nanotubes, Chemical Physics Letters 2003; 372: 860-865 in view of WO 00/17102 to Smalley, et al. and Maruyama, et al., Low-temperature synthesis of high-purity single-walled carbon nanotubes from alcohol, Chemical Physics Letters 2002; 360: 229-234 (hereinafter "Maruyama at __").

The discussion of Claims 1 and 5 accompanying the anticipation rejection supra is expressly incorporated herein by reference. To the extent Singh does not employ an alcohol as the carbon source, this does not impart patentability. Use of alcohols as carbon sources in nanotube synthesis schemes is old and known, and the Examiner takes official notice that it is. In support of taking official notice (i.e. in making sure there is substantial evidence on the record), the Examiner provides:

1. WO 00/17102 to Smalley – see (Smalley 10: 15-20) ("Suitable carbon-containing compounds include . . . oxygen-containing hydrocarbons, e.g., formaldehyde, acetaldehyde, acetone, methanol, ethanol, or mixtures thereof.").

2. Maruyama – see e.g. (Maruyama "Abstract") ("By using alcohol as the carbon source, a new simple catalytic chemical vapor deposition technique to synthesize highpurity single-walled carbon nanotubes at low temperature is demonstrated.").

Use of this known carbon source in a known method is an obvious expedient owing to any number of advantages/motivations, etc., for example the decreased amorphous carbon, etc. See e.g. (Maruyama "Abstract").

VII. Claims 1-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rao, et al., Synthesis of multi-walled and single-walled nanotubes, aligned-nanotube

bundles and nanorods by employing organometallic precursors, Mat Res Innovat 1998; 2: 128–141 in view of US 6,979,433 to Saito, et al.

With respect to Claim 1, Rao teaches a CVD method for growing carbon nanotubes. See generally (Rao at 129 et seq.) ("Experimental"). Rao teaches argon (i.e. an inert), hydrogen, and benzene (i.e. a carbon source). See e.g. (Rao at 129) ("Fig."). A metallocene catalyst is recited. Id. The catalyst is vaporized (Rao at 132, col. 1) and passed with the carbon source into the second furnace where the nanotubes are deposited. To the extent Rao may not disclose the "ceramic support" required by Claims 2-4 and 13, this does not impart patentability. Metal wire deposits for growing carbon nanotubes are old and known, and the Examiner takes official notice that they are. In support of taking official notice (i.e. in making sure there is "substantial evidence" on the record), the Examiner provides US 6,979,433 to Saito, et al. See e.g. (Saito 1: 51 et seq.) (describing wire mesh nanotube collectors – note the claimed metals are taught). To the extent Saito may not disclose the "nano/micro" size limitation claimed, changes in size do not impart patentability. MPEP 2144.04 IV. The combination appears to reflect either or both a combination of prior art elements according to known methods to yield predictable results and simple substitution of one known element for another to obtain predictable results. These bar patentability. See MPEP 2143. Furthermore, one of skill in the art would be motivated to employ a metal wire support to impart structural or compositional features to composites, etc.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCRACKEN whose telephone number is

(571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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